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<110> Schmülling, Thomas
      Werner, Tomás

<120> Method for modifying plant morphology, biochemistry and
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<140> US 10/014,101
<141> 2001-12-10

<150> PCT/EP01/06833
<151> 2001-06-16

<150> EP 00870132.8
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Ala Ser Met Val Lys Arg His Arg Val Ile Tyr Cys Leu Glu Val Val
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Lys Tyr Tyr Asp Glu Thr Ser Gln Tyr Thr Val Asn Glu Glu Met Glu
                325                 330                 335

Glu Leu Ser Asp Ser Leu Asn His Val Arg Gly Phe Met Tyr Glu Lys
            340                 345                 350

Asp Val Thr Tyr Met Asp Phe Leu Asn Arg Val Arg Thr Gly Glu Leu
            355                 360                 365

Asn Leu Lys Ser Lys Gly Gln Trp Asp Val Pro His Pro Trp Leu Asn
    370                 375                 380

Leu Phe Val Pro Lys Thr Gln Ile Ser Lys Phe Asp Asp Gly Val Phe
385                 390                 395                 400

Lys Gly Ile Ile Leu Arg Asn Asn Ile Thr Ser Gly Pro Val Leu Val
                405                 410                 415

Tyr Pro Met Asn Arg Asn Lys Trp Asn Asp Arg Met Ser Ala Ala Ile
            420                 425                 430

Pro Glu Glu Asp Val Phe Tyr Ala Val Gly Phe Leu Arg Ser Ala Gly
            435                 440                 445

Phe Asp Asn Trp Glu Ala Phe Asp Gln Glu Asn Met Glu Ile Leu Lys
    450                 455                 460

Phe Cys Glu Asp Ala Asn Met Gly Val Ile Gln Tyr Leu Pro Tyr His
465                 470                 475                 480

Ser Ser Gln Glu Gly Trp Val Arg His Phe Gly Pro Arg Trp Asn Ile
            485                 490                 495

Phe Val Glu Arg Lys Tyr Lys Tyr Asp Pro Lys Met Ile Leu Ser Pro
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Gly Gln Asn Ile Phe Gln Lys Ile Asn Ser Ser
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11

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            20                  25                  30

Phe Leu Pro Ile Ser Leu Asn Leu Thr Val Leu Thr Asp Pro Phe Ser
        35                  40                  45

Ile Ser Ala Ala Ser His Asp Phe Gly Asn Ile Thr Asp Glu Asn Pro
    50                  55                  60
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13

Gly Ala Val Leu Cys Pro Ser Ser Thr Thr Glu Val Ala Arg Leu Leu
65   70   75   80

Arg Phe Ala Asn Gly Gly Phe Ser Tyr Asn Lys Gly Ser Thr Ser Pro
                85   90   95

Ala Ser Thr Phe Lys Val Ala Ala Arg Gly Gln Gly His Ser Leu Arg
            100   105   110

Gly Gln Ala Ser Ala Pro Gly Gly Val Val Val Asn Met Thr Cys Leu
            115   120   125

Ala Met Ala Ala Lys Pro Ala Ala Val Val Ile Ser Ala Asp Gly Thr
    130   135   140

Tyr Ala Asp Val Ala Ala Gly Thr Met Trp Val Asp Val Leu Lys Ala
145   150   155   160

Ala Val Asp Arg Gly Val Ser Pro Val Thr Trp Thr Asp Tyr Leu Tyr
            165   170   175

Leu Ser Val Gly Gly Thr Leu Ser Asn Ala Gly Ile Gly Gly Gln Thr
            180   185   190

Phe Arg His Gly Pro Gln Ile Ser Asn Val His Glu Leu Asp Val Ile
        195   200   205

Thr Gly Lys Gly Glu Met Met Thr Cys Ser Pro Lys Leu Asn Pro Glu
    210 .   215   220

Leu Phe Tyr Gly Val Leu Gly Gly Leu Gly Gln Phe Gly Ile Ile Thr
225   230   235   240

Arg Ala Arg Ile Ala Leu Asp His Ala Pro Thr Arg Val Lys Trp Ser
            245   250   255

Arg Ile Leu Tyr Ser Asp Phe Ser Ala Phe Lys Arg Asp Gln Glu Arg
            260   265   270

Leu Ile Ser Met Thr Asn Asp Leu Gly Val Asp Phe Leu Glu Gly Gln
        275   280   285

Leu Met Met Ser Asn Gly Phe Val Asp Thr Ser Phe Phe Pro Leu Ser
    290   295   300

Asp Gln Thr Arg Val Ala Ser Leu Val Asn Asp His Arg Ile Ile Tyr
305   310   315   320

Val Leu Glu Val Ala Lys Tyr Tyr Asp Arg Thr Thr Leu Pro Ile Ile
            325   330   335

Asp Gln Val Ile Asp Thr Leu Ser Arg Thr Leu Gly Phe Ala Pro Gly
            340   345   350

Phe Met Phe Val Gln Asp Val Pro Tyr Phe Asp Phe Leu Asn Arg Val
    355   360   365

Arg Asn Glu Glu Asp Lys Leu Arg Ser Leu Gly Leu Trp Glu Val Pro
370   375   380

14

His Pro Trp Leu Asn Ile Phe Val Pro Gly Ser Arg Ile Gln Asp Phe
385   390   395   400

His Asp Gly Val Ile Asn Gly Leu Leu Leu Asn Gln Thr Ser Thr Ser
                    405   410   415

Gly Val Thr Leu Phe Tyr Pro Thr Asn Arg Asn Lys Trp Asn Asn Arg
                420   425   430

Met Ser Thr Met Thr Pro Asp Glu Asp Val Phe Tyr Val Ile Gly Leu
            435   440   445

Leu Gln Ser Ala Gly Gly Ser Gln Asn Trp Gln Glu Leu Glu Asn Leu
    450   455   460

Asn Asp Lys Val Ile Gln Phe Cys Glu Asn Ser Gly Ile Lys Ile Lys
465   470   475   480

Glu Tyr Leu Met His Tyr Thr Arg Lys Glu Asp Trp Val Lys His Phe
                485   490   495

Gly Pro Lys Trp Asp Asp Phe Leu Arg Lys Lys Ile Met Phe Asp Pro
            500   505   510

Lys Arg Leu Leu Ser Pro Gly Gln Asp Ile Phe Asn
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Ala Ile Asp Val Asp Gly His Phe Thr Val His Pro Ser Asp Leu Ala
         35                  40                  45

Ser Val Ser Ser Asp Phe Gly Met Leu Lys Ser Pro Glu Glu Pro Leu
     50                  55                  60

Ala Val Leu His Pro Ser Ser Ala Glu Asp Val Ala Arg Leu Val Arg
 65                  70                  75                  80

Thr Ala Tyr Gly Ser Ala Thr Ala Phe Pro Val Ser Ala Arg Gly His
             85                  90                  95

Gly His Ser Ile Asn Gly Gln Ala Ala Ala Gly Arg Asn Gly Val Val
            100                 105                 110

Val Glu Met Asn His Gly Val Thr Gly Thr Pro Lys Pro Leu Val Arg
            115                 120                 125

Pro Asp Glu Met Tyr Val Asp Val Trp Gly Gly Glu Leu Trp Val Asp
        130                 135                 140

Val Leu Lys Lys Thr Leu Glu His Gly Leu Ala Pro Lys Ser Trp Thr
145                 150                 155                 160

Asp Tyr Leu Tyr Leu Thr Val Gly Gly Thr Leu Ser Asn Ala Gly Ile
                165                 170                 175

Ser Gly Gln Ala Phe His His Gly Pro Gln Ile Ser Asn Val Leu Glu
            180                 185                 190

Leu Asp Val Val Thr Gly Lys Gly Glu Val Met Arg Cys Ser Glu Glu
            195                 200                 205

Glu Asn Thr Arg Leu Phe His Gly Val Leu Gly Gly Leu Gly Gln Phe
    210                 215                 220

Gly Ile Ile Thr Arg Ala Arg Ile Ser Leu Glu Pro Ala Pro Gln Arg
225                 230                 235                 240
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17

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Val Arg Trp Ile Arg Val Leu Tyr Ser Ser Phe Lys Val Phe Thr Glu
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Asp Gln Glu Tyr Leu Ile Ser Met His Gly Gln Leu Lys Phe Asp Tyr
            260             265             270

Val Glu Gly Phe Val Ile Val Asp Glu Gly Leu Val Asn Asn Trp Arg
            275             280             285

Ser Ser Phe Phe Ser Pro Arg Asn Pro Val Lys Ile Ser Ser Val Ser
    290             295             300

Ser Asn Gly Ser Val Leu Tyr Cys Leu Glu Ile Thr Lys Asn Tyr His
305             310             315             320

Asp Ser Asp Ser Glu Ile Val Asp Gln Glu Val Glu Ile Leu Met Lys
            325             330             335

Lys Leu Asn Phe Ile Pro Thr Ser Val Phe Thr Thr Asp Leu Gln Tyr
            340             345             350

Val Asp Phe Leu Asp Arg Val His Lys Ala Glu Leu Lys Leu Arg Ser
            355             360             365

Lys Asn Leu Trp Glu Val Pro His Pro Trp Leu Asn Leu Phe Val Pro
    370             375             380

Lys Ser Arg Ile Ser Asp Phe Asp Lys Gly Val Phe Lys Gly Ile Leu
385             390             395             400

Gly Asn Lys Thr Ser Gly Pro Ile Leu Ile Tyr Pro Met Asn Lys Asp
            405             410             415

Lys Trp Asp Glu Arg Ser Ser Ala Val Thr Pro Asp Glu Glu Val Phe
            420             425             430

Tyr Leu Val Ala Leu Leu Arg Ser Ala Leu Thr Asp Gly Glu Glu Thr
            435             440             445

Gln Lys Leu Glu Tyr Leu Lys Asp Gln Asn Arg Arg Ile Leu Glu Phe
    450             455             460

Cys Glu Gln Ala Lys Ile Asn Val Lys Gln Tyr Leu Pro His His Ala
465             470             475             480

Thr Gln Glu Glu Trp Val Ala His Phe Gly Asp Lys Trp Asp Arg Phe
            485             490             495

Arg Ser Leu Lys Ala Glu Phe Asp Pro Arg His Ile Leu Ala Thr Gly
            500             505             510

Gln Arg Ile Phe Gln Asn Pro Ser Leu Ser Leu Phe Pro Pro Ser Ser
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Ser Ser Ser Ser Ala Ala Ser Trp
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19

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Leu Pro Leu Val Gly His Leu Glu Phe Glu His Val His His Ala Ser
        35   40   45

Lys Asp Phe Gly Asn Arg Tyr Gln Leu Ile Pro Leu Ala Val Leu His
    50   55   60

Pro Lys Ser Val Ser Asp Ile Ala Ser Thr Ile Arg His Ile Trp Met
65   70   75   80

Met Gly Thr His Ser Gln Leu Thr Val Ala Ala Arg Gly Arg Gly His
                85   90   95

Ser Leu Gln Gly Gln Ala Gln Thr Arg His Gly Ile Val Ile His Met
            100   105   110

Glu Ser Leu His Pro Gln Lys Leu Gln Val Tyr Ser Val Asp Ser Pro
        115   120   125

Ala Pro Tyr Val Asp Val Ser Gly Gly Glu Leu Trp Ile Asn Ile Leu
    130   135   140

His Glu Thr Leu Lys Tyr Gly Leu Ala Pro Lys Ser Trp Thr Asp Tyr
145   150   155   160

Leu His Leu Thr Val Gly Gly Thr Leu Ser Asn Ala Gly Ile Ser Gly
                165   170   175

Gln Ala Phe Arg His Gly Pro Gln Ile Ser Asn Val His Gln Leu Glu
            180   185   190

Ile Val Thr Gly Lys Gly Glu Ile Leu Asn Cys Thr Lys Arg Gln Asn
            195   200   205

Ser Asp Leu Phe Asn Gly Val Leu Gly Gly Leu Gly Gln Phe Gly Ile
    210   215   220

Ile Thr Arg Ala Arg Ile Ala Leu Glu Pro Ala Pro Thr Met Asp Gln
225   230   235   240

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Glu Gln Leu Ile Ser Ala Gln Gly His Lys Phe Asp Tyr Ile Glu Gly
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Phe Val Ile Ile Asn Arg Thr Gly Leu Leu Asn Ser Trp Arg Leu Ser
            260                 265                 270

Phe Thr Ala Glu Glu Pro Leu Glu Ala Ser Gln Phe Lys Phe Asp Gly
            275             280                 285

Arg Thr Leu Tyr Cys Leu Glu Leu Ala Lys Tyr Leu Lys Gln Asp Asn
    290                 295                 300

Lys Asp Val Ile Asn Gln Glu Val Lys Glu Thr Leu Ser Glu Leu Ser
305                 310                 315                 320

Tyr Val Thr Ser Thr Leu Phe Thr Thr Glu Val Ala Tyr Glu Ala Phe
            325                 330                 335

Leu Asp Arg Val His Val Ser Glu Val Lys Leu Arg Ser Lys Gly Gln
            340                 345                 350

Trp Glu Val Pro His Pro Trp Leu Asn Leu Leu Val Pro Arg Ser Lys
            355                 360                 365

Ile Asn Glu Phe Ala Arg Gly Val Phe Gly Asn Ile Leu Thr Asp Thr
    370                 375                 380

Ser Asn Gly Pro Val Ile Val Tyr Pro Val Asn Lys Ser Lys Trp Asp
385                 390                 395                 400

Asn Gln Thr Ser Ala Val Thr Pro Glu Glu Glu Val Phe Tyr Leu Val
            405                 410                 415

Ala Ile Leu Thr Ser Ala Ser Pro Gly Ser Ala Gly Lys Asp Gly Val
            420                 425                 430

Glu Glu Ile Leu Arg Arg Asn Arg Arg Ile Leu Glu Phe Ser Glu Glu
            435                 440                 445

Ala Gly Ile Gly Leu Lys Gln Tyr Leu Pro His Tyr Thr Thr Arg Glu
    450                 455                 460

Glu Trp Arg Ser His Phe Gly Asp Lys Trp Gly Glu Phe Val Arg Arg
465                 470                 475                 480

Lys Ser Arg Tyr Asp Pro Leu Ala Ile Leu Ala Pro Gly His Arg Ile
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Phe Gln Lys Ala Val Ser Tyr Ser
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<210> 17
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<223> Description of Artificial Sequence:oligonucleotide
     : primer or probe

<400> 17

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<220>
<223> Description of Artificial Sequence:oligonucleotide
: primer or probe

<400> 18

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<210> 19
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<220>
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: primer or probe

<400> 19

gcggtacccc cattaaccta cccgtttg   28

<210> 20
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<223> Description of Artificial Sequence:oligonucleotide
: primer or probe

<400> 20

gcggtaccag acgatgaacg tacttgtctg ta   32

<210> 21
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<212> DNA
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: primer or probe

<400> 21

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<210> 22
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<212> DNA

<213> Artificial Sequence

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     : primer or probe

<400> 22

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<210> 23
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:oligonucleotide
     : primer or probe

<400> 23

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<210> 24
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<212> DNA
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<220>
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     : primer or probe

<400> 24

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<210> 25
<211> 1728
<212> DNA
<213> Arabidopsis thaliana

<400> 25

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<210> 26
<211> 1506
<212> DNA
<213> Arabidopsis thaliana

<400> 26

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ttttga   1506

<210> 27
<211> 1572
<212> DNA
<213> Arabidopsis thaliana

<400> 27

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cacaacgaat tcgccggaaa actcacctcc tcctcctcct ccgtcgaatc agccgccaca 180

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aaatataaat atgatcccaa aatgatatta tcaccgggac aaaatatatt tcaaaaaata 1560

aactcgagtt ag                                                    1572
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<210> 28
<211> 1575
<212> DNA
<213> Arabidopsis thaliana

<400> 28

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ccaaccttaa tcaaatcaga tgagggcatt gatgttttct tacccatatc actcaacctt 120
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27

acggtcctaa ccgatccctt ctccatctct gccgcttctc acgacttcgg taacataacc 180

gacgaaaatc ccggcgccgt cctctgccct tcctccacca cggaggtggc tcgtctcctc 240

cgtttcgcta acggaggatt ctcttacaat aaaggctcaa ccagccccgc gtctactttc 300

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gcagacggga cttacgctga cgtggctgcc gggacgatgt gggtggatgt tctgaaggcg 480

gcggtggata gaggcgtctc gccggttaca tggacggatt atttgtatct cagcgtcggc 540

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gacatattta attaa   1575

<210> 29
<211> 1611
<212> DNA
<213> Arabidopsis thaliana

<400> 29
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28

accgtccacc cttccgactt agcctccgtc tcctcagact tcggtatgct gaagtcacct 180

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<210> 31
<211> 84
<212> DNA
<213> Arabidopsis thaliana

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tcggcgatga taccagagat cgat   84

<210> 32
<211> 28
<212> PRT
<213> Arabidopsis thaliana

<400> 32
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             20   25

<210> 33
<211> 2814
<212> DNA
<213> Arabidopsis thaliana

<400> 33

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Arg Ile Gly Ala Ile Asp Val Asp Gly His Phe Thr Val His Pro Ser
        35   40   45

Asp Leu Ala Ser Val Ser Ser Asp Phe Gly Met Leu Lys Ser Pro Glu
    50   55   60

Glu Pro Leu Ala Val Leu His Pro Ser Ser Ala Glu Asp Val Ala Arg
65   70   75   80

Leu Val Arg Thr Ala Tyr Gly Ser Ala Thr Ala Phe Pro Val Ser Ala
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Arg Gly His Gly His Ser Ile Asn Gly Gln Ala Ala Ala Gly Arg Asn
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Gly Val Val Val Glu Met Asn His Gly Val Thr Gly Thr Pro Lys Pro
            115   120   125

Leu Val Arg Pro Asp Glu Met Tyr Val Asp Val Trp Gly Gly Glu Leu
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Trp Val Asp Val Leu Lys Lys Thr Leu Glu His Gly Leu Ala Pro Lys
145   150   155   160

Ser Trp Thr Asp Tyr Leu Tyr Leu Thr Val Gly Gly Thr Leu Ser Asn
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Ala Gly Ile Ser Gly Gln Ala Phe His His Gly Pro Gln Ile Ser Asn
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Val Leu Glu Leu Asp Val Val Thr Gly Lys Gly Glu Val Met Arg Cys
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Ser Glu Glu Glu Asn Thr Arg Leu Phe His Gly Val Leu Gly Gly Leu
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Gly Gln Phe Gly Ile Ile Thr Arg Ala Arg Ile Ser Leu Glu Pro Ala
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Pro Gln Arg Val Arg Trp Ile Arg Val Leu Tyr Ser Ser Phe Lys Val
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Phe Asp Tyr Val Glu Gly Phe Val Ile Val Asp Glu Gly Leu Val Asn
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Leu Arg Ser Lys Asn Leu Trp Glu Val Pro His Pro Trp Leu Asn Leu
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385             390             395                 400

Gly Ile Leu Gly Asn Lys Thr Ser Gly Pro Ile Leu Ile Tyr Pro Met
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Glu Glu Thr Gln Lys Leu Glu Tyr Leu Lys Asp Gln Asn Arg Arg Ile
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Leu Glu Phe Cys Glu Gln Ala Lys Ile Asn Val Lys Gln Tyr Leu Pro
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Asp Arg Phe Arg Ser Leu Lys Ala Glu Phe Asp Pro Arg His Ile Leu
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39

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51

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52

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54

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76

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